Journal of Research in Health Sciences
ISSN: 2228-7809 | https://jrhsjournal.com

Supplementary Material for Polyphenolic Profiling of Buckwheat-Derived Honey, Nectar, and Pollen

Dr. Thabo Nkosi[1]*, Dr. Ayesha Khan[1], Dr. Sipho Dlamini[2], Dr. Naledi Mokoena[2], Dr. Peter van der Merwe[3], Dr. Zanele Khumalo[3]

[1]Groote Schuur Hospital, Cape Town, South Africa
[2]Charlotte Maxeke Johannesburg Academic Hospital, Johannesburg, South Africa
[3]Steve Biko Academic Hospital, Pretoria, South Africa

Figure caption

Figure S1. Micrographs of pollen types contributing pollen spectrum with >15%.

Table captions

Table S1. Melissopalynological analysis of presence nectraiferous and nectarless species in Serbian (H1-H4) and Polish honey samples (H5, H6).

Table S2. Content of 31 phenolic compounds (mg/kg), TPC (mg GAE/kg) and RSA (%) in buckwheat honey samples from Serbia (H1-H4) and Poland (H5, H6).

Table S1. Melissopalynological analysis of presence nectraiferous and nectarless species in Serbian (H1-H4) and Polish honey samples (H5, H6).

Type of nectraiferous/nectarless plant		**Serbian honey**				**Polish honey**	
Genus	**Family**	**H1**	**H2**	**H3**	**H4**	**H5**	**H6**
Achilea type	Asteraceae	0.90	0	1.09	0.31	0.71	1.53
Ailanthus	Simaroubaceae	0	0	0.22	0	0	0
*Alnus**	Betulaceae	0	0.12	0.22	0.92	0.12	0
Amorpha type	Fabaceae	0	0.74	19.21	3.08	0	0
Apiaceae	Apiaceae	0	0.12	0.66	0.92	0	0
*Artemisia**	Asteraceae	0	0	0	0.62	2.60	0.87
*Aster*type	Asteraceae	0.90	0.12	0	0	0.24	0
Astragalus type	Fabaceae	4.50	6.62	2.84	6.15	0.47	3.06
Betula	Betulaceae	0	0	0.66	1.23	0	0
Brassica napus	Brassicaceae	0	0	0	0	11.24	0
Brassicaceae	Brassicaceae	0.13	0.49	0.22	0.92	0	27.29

Carduus	Asteraceae	0	0	1.09	0.31	0	0
Cariophilaceae	Cariophilaceae	0	0	0	0	0	0
Centaurea cyans	Asteraceae	0	0	0	0	1.78	0.44
Centaurea jacea	Asteraceae	0.13	0.37	0	0	0	0
*Chenopodiaceae**	Amaranthaceae	0	0	0	0	0.36	4.37
Clematis	Rannunculaceae	0	0	5	0	0	0
Convolvulus	Convolvulaceae	0	0	0	0	0	0.22
*Corylus**	Betulaceae	0	0	0	0.62	0	0
*Cupressaceae**	Cupressaceae	0	0	1.75	0.92	0	0
Echium	Boraginaceae	6.95	0.25	0	0	0	0
Epilobium	Onagraceae	0.26	0	0.22	0	0	0
Euphorbia	Euphorbiaceae	0	0	0.22	0	0	0
Fagopyrum	Polygonaceae	0.77	1.10	10.26	4.00	18.70	20.52
Fenestrate	Asteraceae	0.26	0.12	1.09	3.08	0.59	7.21
Filipendula	Rosaceae	1.42	0.49	18.12	29.85	0.12	0.66
*Fraxinus americana/pensylvanica**	Oleaceae	80.44	86.64	0.22	0	49.70	6.77
*Fraxinus ornus**	Oleaceae	0.13	0	0	0	0	0
Gleditschia	Fabaceae	0	0	1.31	0	0	0
Hedera	Araliaceae	0	0	0	0.62	0	0
Helianthus	Asteraceae	0	0	0.22	0.62	0.59	0.22
Hypericum	Hypericaceae	0.26	0.61	0	0.31	0.12	0.22
*Juniperus**	Cupressaceae	0.13	0.74	0	0	0.59	0.22
Lamiaceae S type	Lamiaceae	0.51	0.49	0.44	0.31	0	0
Ligustrum	Oleaceae	0	0	0	0.31	0	0
Loranthus type	Loranthaceae	0	0	0	0.92	0	0
Lotus	Fabaceae	0.51	0.12	0	0.92	0	0

*Ostrya**	Betulaceae	0.13	0	0.66	0	0	0
Phacelia	Boraginaceae	0	0	0	0	4.62	0
*Plantago**	Plantaginaceae	0	0.12	1.97	2.77	0.24	1.09
*Poaceae**	Poaceae	0	0	0.66	0.62	0	0.66
Poligonum	Polygonaceae	0	0	0	0	0	0.44
*Populus**	Salicaceae	0	0	0	0.31	0	0
Rhamnus type	Rhamnaceae	0	0	2.40	4.92	0	0
Robinia	Fabaceae	0	0	1.75	2.77	0	0
Rosaceae (*Prunus* type)	Rosaceae	0.51	0	2.40	7.08	1.30	1.31
Rubus	Rosaceae	0.39	0.12	14.85	10.77	0.71	17.69
*Rumex**	Polygonaceae	0	0	0	2.15	0.47	1.53
Salix	Salicaceae	0	0	0.44	0.62	0	0
Sambucus nigra	Capryfoliaceae	0	0	0.22	0.31	0	0
Senecio	Asteraceae	0	0	0.44	0	2.25	1.75
Teucrium	Lamiaceae	0	0	6.77	3.69	0	0
Tilia	Malvaceae	0	0	0.66	2.77	0.12	0.22
Trifolium pratense	Fabaceae	0.39	0.37	1.97	4.00	1.54	1.53
*Ulmus**	Ulmaceae	0	0	0	0.31	0	0
*Urtica**	Urticaceae	0.13	0	0	0	0	0
Vicia	Fabaceae	0	0.25	0	0	0.71	0
Viola	Violaceae	0.26	0	0	0	0	0.22
*Zea**	Poaceae	0	0	0	0	0.12	0
Sum		100	100	100	100	100	100

Pollen frequency classes: P-"Predominant pollen" (more than 45% of pollen grains counted), S-"Secondary pollen" (16-45%); I-"Important minor pollen" (3-15%); M-"Minor important pollen" (less than 3%).* Nectarless species.

Table S2. Content of 31 phenolic compounds (mg/kg), TPC (mg GAE/kg) and RSA (%) in buckwheat honey samples from Serbia (H1-H4) and Poland (H5, H6).

Content of 31 phenolic compounds (mg/kg), TPC (mgGA/kg) and RSA (%) in buckwheat honey samples from Serbia (1-4) and Poland (5,6).

No	Phenolic compound	Serbia					Poland		
		H1	**H2**	**H3**	**H4**	**Mean ± SD**	**H5**	**H6**	**Mean ± SD**
1	Quercetin	2.2206	3.2332	3.8906	1.6997	2.761 ± 0.986	26.3997	2.9557	14.678 ± 16.577
2	Kaempferol	0.5851	0.7271	0.7111	0.2938	0.579 ± 0.201	1.0238	0.8205	0.922 ± 0.144
3	Galangin	2.6481	3.0755	2.2044	0.8132	2.185 ± 0.981	0.5914	0.3726	0.482 ± 0.155
4	Kaempferide	0.0796	0.0864	0.0275	0	0.048 ± 0.042	0.1799	0.0973	0.139 ± 0.058
5	Apigenin	0.6039	0.8949	0.3455	0.1515	0.499 ± 0.323	0.2097	0.1879	0.199 ± 0.015
6	Chrysin	3.7769	4.2830	3.4321	1.6963	3.297 ± 1.123	0.7900	0.7204	0.755 ± 0.049
7	Acacetin	0	0	0	0	0	0.1188	0.0814	0.100 ± 0.026
8	Luteolin	0.3694	0.4219	0.1082	0.0500	0.237 ± 0.186	0.0378	0.0723	0.055 ± 0.024
9	Genkwanin	0	0	0	0	0	0.1385	0.0911	0.115 ± 0.034
10	Pinocembrin	6.0022	6.4967	5.0917	2.6685	5.065 ± 1.700	1.1658	0.8831	1.024 ± 0.200
11	Naringenin	0.1227	0.1433	0.0829	0.0377	0.097 ± 0.047	0.2021	0.1938	0.198 ± 0.006
12	Eriodictyol	0	0.2035	0.1026	0.0861	0.098 ± 0.083	0	0.0864	0.043 ± 0.061
13	Genistein	0.2153	0.3136	0	0.0391	0.142 ± 0.148	0	0	0
	Sum of flavonoids	**16.624**	**19.879**	**15.997**	**7.536**	**15.01 ± 5.27**	**30.857**	**6.563**	**18.71 ± 17.18**
14	*p*-Hydroxybenzoic acid	3.8421	3.9913	7.4047	2.7905	4.507 ± 2.004	31.5745	15.9662	23.770 ± 11.037
15	Protocatechuic acid	0.0914	0.0816	0.5655	0.1914	0.232 ± 0.227	0	0	0
16	Vanillic acid	1.4216	1.4767	0.9610	0.4349	1.074 ± 0.484	0.8681	1.0729	0.971 ± 0.145
17	p-Hydroxyphenylacetic acid	1.0342	1.1279	0.9485	0.4110	0.880 ± 0.321	2.7621	0.9031	1.833 ± 1.315
18	Caffeic acid	5.1628	4.7716	3.0428	1.7931	3.693 ± 1.566	1.6230	1.4779	1.550 ± 0.103
19	5-*O*-Caffeoylquinic acid	0.2914	0.4560	0.1133	0.0610	0.230 ± 0.180	0.4093	0.1276	0.268 ± 0.199
20	*p*-Coumaric acid	2.6375	2.6893	4.0326	1.9203	2.820 ± 0.881	15.5523	11.1211	13.337 ± 3.133

21	Ferulic acid	3.7280	3.9435	2.5104	1.3847	2.892 ± 1.186	2.7642	2.2729	2.519 ± 0.347
22	Sinapic acid	0	0	0.0798	0.0265	0.027 ± 0.038	0.0634	0	0.032 ± 0.045
	Sum of phenolic acids	**18.209**	**18.538**	**19.659**	**9.013**	**16.36 ± 4.93**	**55.617**	**32.942**	**44.28 ± 16.03**
23	Apigenin 7-O-glucoside (Apigetrin)	0	0	0	0	0	0	0	0
24	Apigenin 8-C-glucoside (Vitexin)	0	0	0	0	0	0.0793	0	0.040 ± 0.056
25	Kaempferol 7-O-glucoside	0.0437	0.0732	0.0376	0	0.039 ± 0.030	0.0384	0.0236	0.031 ± 0.010
26	Isorhamnetin 3-O-glucoside	0	0.0313	0.0248	0	0.014 ± 0.016	0	0	0
27	Isorhamnetin 3-O-rutinoside	0	0	0	0	0	0.0223	0	0.011 ± 0.016
28	Naringenin 7-O-neohesperidoside (Naringin)	0.0488	0.1336	0	0	0.046 ± 0.063	0.0625	0	0.031 ± 0.044
29	Quercetin 3-O-rutinoside (Rutin)	0.0475	0	0	0	0.012 ± 0.024	7.9872	0	3.994 ± 5.648
30	Quercetin 3-O-galactoside (Hyperoside)	0.0425	0.0643	0.0317	0	0.035 ± 0.027	0.0528	0	0.026 ± 0.037
31	Quercetin 3-O-rhamnoside (Quercitrin)	0.0938	0.1545	0.1821	0.0531	0.121 ± 0.058	1.1268	0.0633	0.595 ± 0.752
	Sum of glycosides	**0.276**	**0.457**	**0.276**	**0.053**	**0.266 ± 0.165**	**9.369**	**0.087**	**4.728 ± 6.564**
	Sum of polyphenols	**35.109**	**38.874**	**35.931**	**16.602**	**31.63 ± 10.15**	**95.844**	**39.591**	**67.72 ± 39.78**
	TPC (mgGA/kg)	628.92	721.00	565.72	437.71	588.34 ± 118.95	1496.83	711.88	1104.35 ± 555.04
	RSA (%)	7.72	8.78	7.39	5.85	7.44 ± 1.21	10.25	6.43	8.34 ± 2.71

Mean ± SD - Mean value ± standard deviations ($p \leq 0.05$).